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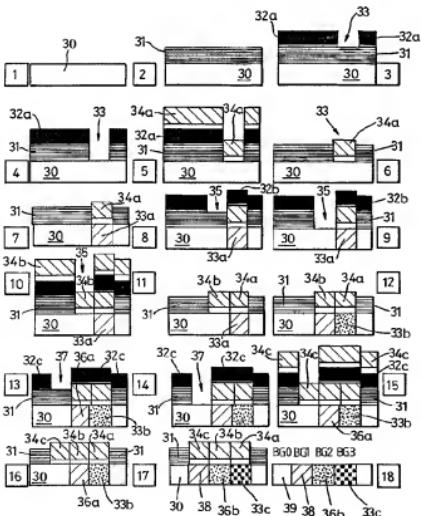
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(57) **Abstract:** A quantum well intermixing (QWI) technique for modifying an energy bandgap during the formation of optical semiconductor devices enables spatial control of the QWI process so as to achieve differing bandgap shifts across a wafer, device or substrate surface. The method includes: patterning the surface of a semiconductor substrate with QWI-initiating material in first regions of the surface; conducting a first thermal processing cycle on the substrate to generate a first bandgap shift in the first regions; patterning the surface of the substrate with QWI-initiating material in second regions of the surface, distinct from said first regions; and conducting a second thermal processing cycle on the substrate to generate a second bandgap shift in the second regions, and to generate a cumulative bandgap shift in the first regions, the cumulative bandgap shift being the cumulative result of said first and second thermal processing cycles. Further steps can produce additional cumulative bandgap shifts.



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